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Supplement of

A 125-year record of climate and chemistry variability at the Pine Island Glacier ice divide, Antarctica

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Supporting Information

A 125-year record of climate and chemistry variability at the Pine Island Glacier ice divide, Antarctica

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Summary

There are 6 pages in this Supporting Information, including 4 tables, 2 figures, and references.

Table S1 – Instrumental conditions and measurement parameters for the CCI Thermo Electron Element2 ICP-SFMS instrument.

Forward power	1280 W
Coolant gas	~16 l min ⁻¹
Auxiliary gas	~0.85 l min ⁻¹
Sample gas	~0.8 l min ⁻¹
Sample cone	Ni; 1.1 mm
Skimmer cone	Ni; 0.8 mm
Sample inlet	ESI ApexQ
Nebulizer	ESI PFA-ST
Resolution (m/Δm)	Low: 400; medium: 4.000 and high: 10.000
Sample uptake rate	100 μL min ⁻¹
Sensitivity	800,000 cps (counts per second) for 100 ng l ⁻¹ ¹¹⁵ In
Total measurement time per sample	2min20s

Table S2 – Average instrument and procedural blanks, and procedural detection limits (DL) compared to studies analyzed in the same ICP-SFMS and similar instruments.

Elements	This work ^a		Dixon, 2013 ^b		Osterberger <i>et al.</i> , 2006 ^c		Krachler <i>et al.</i> , 2005 ^d		Barbante <i>et al.</i> , 1999 ^e	
	Blanks	DL	Blanks	DL	Blanks	DL	Blanks	DL	Blanks	DL
Al (ng/g)	0.31±0.11	0.33	0.21	0.14	0.070	0.040	0.2	0.093	-	-
Ba (pg/g)	0.49±0.13	0.38	0.35	0.63	< LD	0.33	3.14	0.38	5.9	1.8
Ca (ng/g)	0.18±0.03	0.09	0.095	0.034	< LD	0.110	-	-	-	-
Fe (ng/g)	0.03±0.02	0.05	0.12	0.077	< LD	0.010	0.008	0.0018	0.06	0.033
K (ng/g)	0.05±0.02	0.06	0.26	0.038	-	-	-	-	-	-
Mg (ng/g)	0.79±0.13	0.38	0.42	0.24	-	-	-	-	-	-
Mn (pg/g)	0.72±0.31	0.94	0.45	1.25	< LD	1	0.8	0.28	5.2	1.8
Na (ng/g)	0.25±0.07	0.21	0.38	0.30	-	-	-	-	-	-
S (ng/g)	0.36±0.02	0.06	1.13	0.27	< LD	0.29	-	-	-	-
Sr (pg/g)	0.73±0.25	0.74	0.23	0.23	0.2	0.3	8.11	0.65	-	-
Ti (pg/g)	0.57±0.22	0.66	3.81	2.65	< LD	0.7	-	-	-	-

^a Error corresponds to 1 σ . LD calculated by 3 σ of 10 DI water samples (ICP-SFMS. Element 2/UMaine); ^b LD calculated by 3 σ of 8 DI water samples (ICP-SFMS. Element 2/UMaine); ^c LD calculated by 3 σ of 10 DI water samples (ICP-SFMS. Element 2/UMaine); ^d LD calculated by 3 σ of 15 DI water samples (ICP-SFMS. Finnigan MAT/Bremen. Germany), and ^e LD calculated by 3 σ of 5 DI water samples (ICP-SFMS. Finnigan MAT/Bremen. Germany).

Table S3 – Global mean volcanic quiescent degassing background minimum and maximum and Mount Erebus volcanic plume minimum and maximum contributions at MJ site.

Elements	Concentration	Excess Concentration	Global Volcanic		Local Volcanic	
			Max	Min	Max	Min
Al (ng g ⁻¹)	2.64	< 0.01	-	-	0.0000025	0.0000015
Ca (ng g ⁻¹)	3.01	1.24	-	-	0.0000019	0.0000012
Fe (ng g ⁻¹)	0.62	< 0.01	-	-	0.0000011	0.0000006
K (ng g ⁻¹)	1.78	0.05	-	-	0.0000035	0.0000021
Mn (pg g ⁻¹)	28.10	11.43	3.84	2.31	0.63	0.42
Na (ng g ⁻¹)	21.91	< 0.01	-	-	0.0000039	0.0000024
S (ng g ⁻¹)	10.24	8.15	1.49	0.99	0.49	0.29
Ti (pg g ⁻¹)	14.15	< 0.01	-	-	0.0004	0.00024

Table S4 – Principal components correlation matrix determined for 2,137 samples in the MJ ice core (PCA correlations > 0.4 are shown in red bold).

	Al	Ba	Ca	Fe	K	Mg	Mn	Na	S	Sr	Ti
Al	1	0.34	0.09	0.23	0.15	0.74	0.26	0.14	0.33	0.21	0.41
Ba	0.34	1	0.39	0.44	0.52	0.34	0.64	0.47	0.41	0.46	0.39
Ca	0.09	0.39	1	0.20	0.30	0.18	0.29	0.28	0.18	0.41	0.14
Fe	0.23	0.44	0.20	1	0.25	0.10	0.30	0.18	0.17	0.21	0.38
K	0.15	0.52	0.30	0.25	1	0.29	0.59	0.64	0.34	0.45	0.13
Mg	0.74	0.34	0.18	0.10	0.29	1	0.42	0.51	0.39	0.58	0.25
Mn	0.26	0.64	0.29	0.30	0.59	0.42	1	0.72	0.55	0.42	0.22
Na	0.14	0.47	0.28	0.18	0.64	0.51	0.72	1	0.41	0.75	0.12
S	0.33	0.41	0.18	0.17	0.34	0.39	0.55	0.41	1	0.33	0.27
Sr	0.21	0.46	0.41	0.21	0.45	0.58	0.42	0.75	0.33	1	0.24
Ti	0.41	0.39	0.14	0.38	0.13	0.25	0.22	0.12	0.27	0.24	1

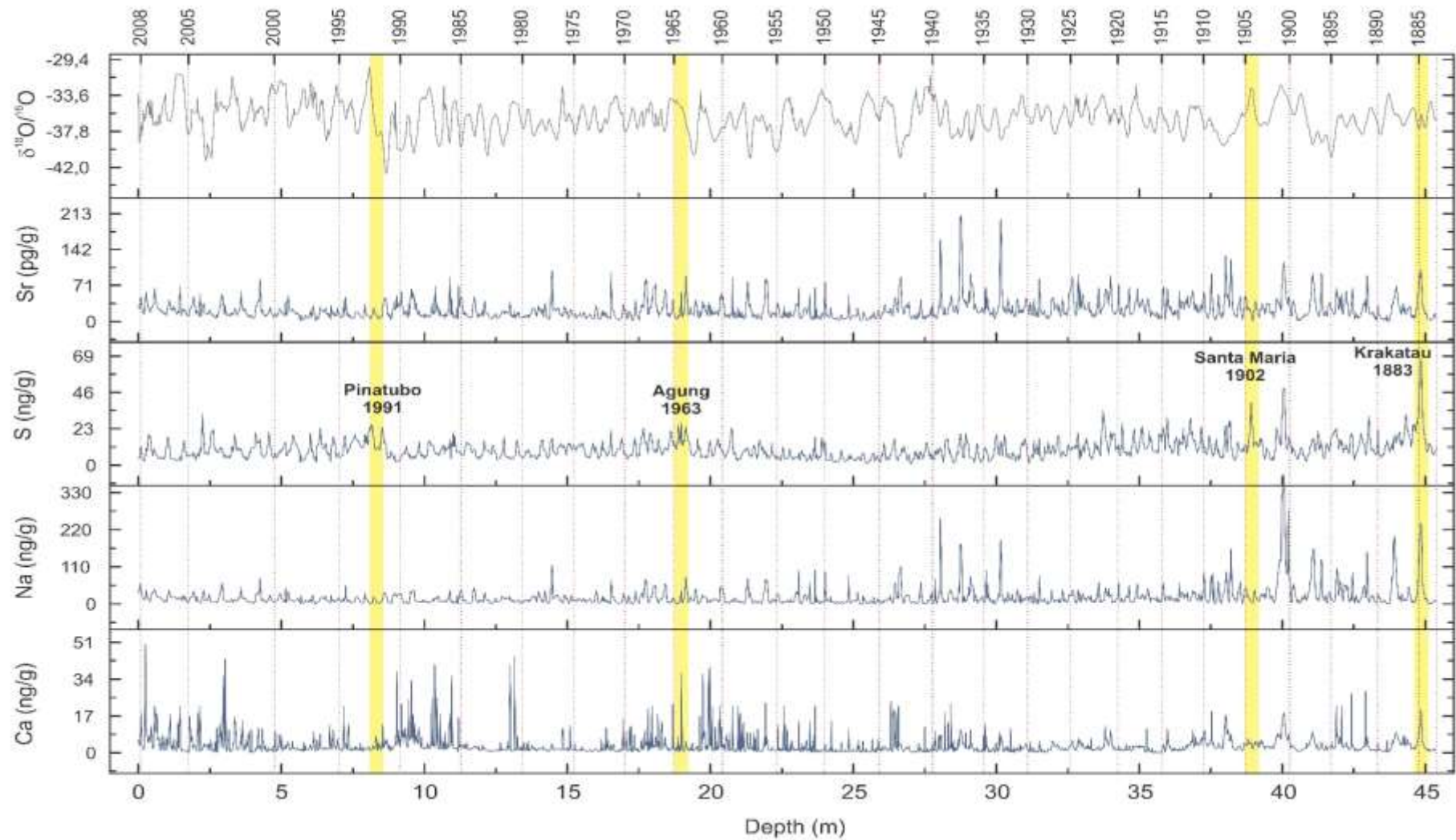


Figure S1 - Mount Johns ice core timescale based on the $\delta^{18}\text{O}$, Sr, S, Na, and Ca seasonal variability and major volcanic events in the period.

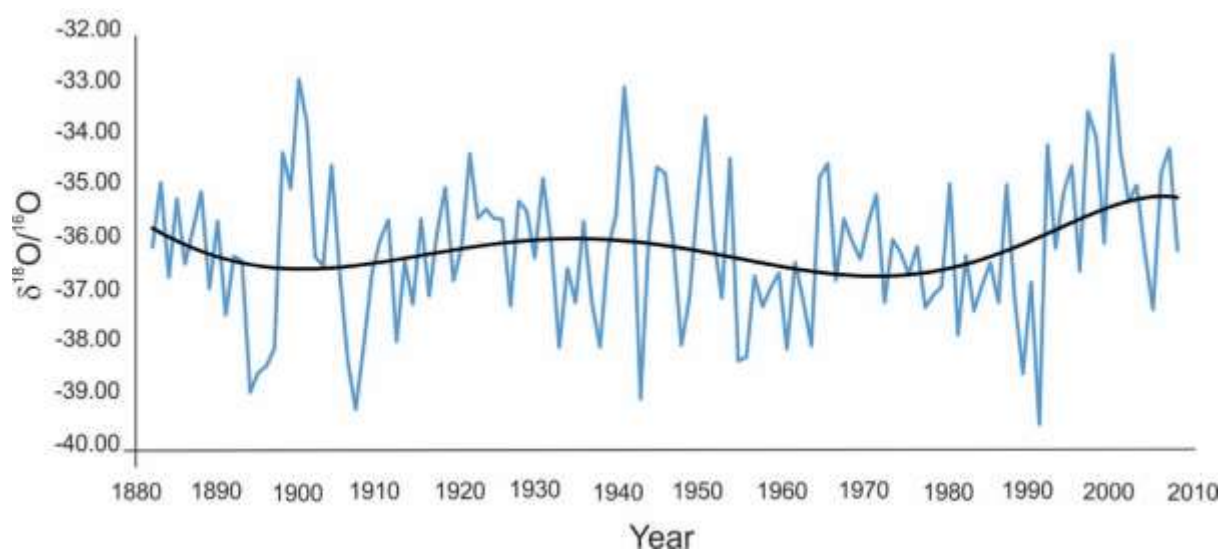


Figure S2 – Mount Johns annual average of $\delta^{18}\text{O}$ and the trend line (black line).

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